PROBLEM NO. 3.63	ME 232	Date:	name	SHEET 1 of 1

GIVEN: R22 $m = 2kg$
$P_1 = 6 bars$ $V_1 = .06 m^3$
$P_2 = 6 bars$ $V_2 = .09 m^3$

REQ'D: work & heat transfer in KJ

SOL'N: $W = \int_1^2 P dV$ $W = P(V_2 - V_1)$ ✓

$W = 6 bars (.03 m^3) = (6 \times 10^5 N/m^2)(.03 m^3) = 18000 Nm$

$W = +18 KJ$

$Q - W = \Delta U = m(U_2 - U_1)$ ✓

$v_1 = .06 m^3 / 2kg = .03 m^3/kg$

$v_2 = .09 m^3 / 2 kg = .045 m^3/kg$

FROM TABLE A-17 @ 6bars: $v_g = .0392 m^3/kg$, $v_f = .0007927 m^3/kg$

$v_x = v_f + x(v_g - v_f) \rightarrow x = \frac{v_x - v_f}{v_g - v_f} = \frac{.06 - .0007927}{.0392 - .0007927}$

$x = 1.54156$ ~~1.54156~~ 0.76

$U_1 = U_f + x(U_g - U_f) = 51.53 + 1.54156(228.44 - 51.53)$

From Table A-17 $U_f = 51.53 KJ/kg$
$U_g = 228.44 KJ/kg$

$U_1 = 324.2017 KJ/kg$

FROM TABLE A-18 @ $P_2 = 6 bars$ & $v_2 = .045 m^3/kg$

$U_2 = 246.58 - (246.58 - 243.49) \times \left(\frac{.045330 - .045}{.045 - .044431}\right)$

$U_2 = 245.236 KJ/kg$ ✓

$Q - W = m(U_2 - U_1)$ ✓

$Q = m(U_2 - U_1) + W = 2kg(245.236 - 324.2017 KJ/kg) - 18 KJ$

$Q = +176.022 KJ$

RESULT: $W = +18 KJ$, $Q = -176.022 KJ$

7

FORMAT FOR WORKING PROBLEMS

- Use 8 1/2 x 11 inch engineering calculation paper, with 5 squares to the inch. It comes in pads and is available in the Campus Bookstore in the Student Center. See the attached sample problem.

- Information given in the problem, or obtained from other sources (such as tables, handbooks, etc.) is to be shown in the "GIVEN" section.

- Show what is to be found in the "REQUIRED" section. This section can be brief; usually no more than two lines will be needed.

- The actual work involved in finding the solution is to be carried out in the "SOLUTION" section. Perform the work vertically and in proper sequence.

- Any equations or formulas used must be given. All sign conventions used must be given.

- Use only one side of the paper. If more than one sheet of paper is needed for a problem, repeat the heading (see the sample problem) on all sheets used. Do not crimp the corners together in any way. Either leave the sheets loose or staple them together in the upper, left-hand corner. In all cases, give the sheet number in the upper, right-hand corner (see sample problem) such as "Sheet 1 of 1"; or if two sheets are used, the first would be labeled "1 of 2" and the second "2 of 2".

- Only one problem per sheet of paper.

- All work is to be done in pencil. Ink is not acceptable at any time. Use of a mechanical pencil with thin lead is strongly recommended.

- A result is not complete without the proper units. In SI particularly, use the conventions shown in the text. If the answer is a vector, it generally requires that a direction be included in the result.

- The required method for solving a problem in SI is as follows:

  a) Convert all data to base units (Newtons, meters, kilograms).
  b) Solve the equation and give results in base units.
  c) As a last step, adjust result using proper prefix to the unit(s).